BIOLOGY

Class 12 - Biology

Date: 07.02.2023

Time Allowed: 3 hours **Maximum Marks: 70**

Section A

1. α - interferon acts as **[1]**

   a) Allergen
   b) Carcinogen
   c) Sedative
   d) Biological response modifier

2. Big holes in Swiss cheese are made by a: **[1]**

   a) a machine
   b) a fungus that releases a lot of gases during its metabolic activities
   c) a bacterium producing a large amount of carbon dioxide
   d) a bacterium that produces methane gas

3. Match the following organisms with the products they produce: **[1]**

(a) Lactobacillus	(i) Cheese
(b) Saccharomyces cerevisiae	(ii) Curd
(c) Aspergillus niger	(iii) Citric Acid
(d) Acetobacter aceti	(iv) Bread
	(v) Acetic Acid

   Select the correct option:

   a) (a)-(ii), (b)-(iv), (c)-(v), (d)-(iii)
   b) (a)-(ii), (b)-(i), (c)-(iii), (d)-(v)
   c) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(v)
   d) (a)-(iii), (b)-(iv), (c)-(v), (d)-(i)

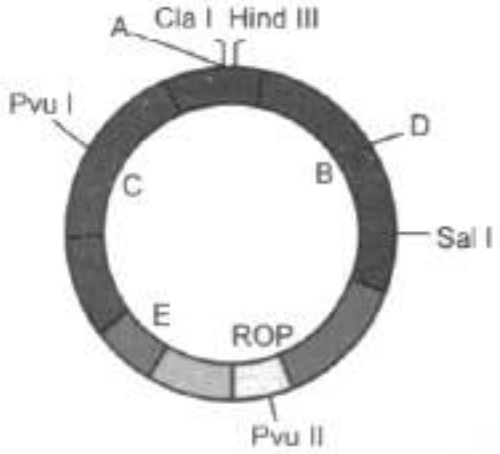
4. The International Centre for Genetic Engineering and Biotechnology established by the United Nations Organization (UNO) is located at: **[1]**

   a) New Delhi
   b) Washington
   c) Tokyo
   d) Paris

5. A gene whose expression helps to identify transformed cell is known as: **[1]**

   a) Selectable marker
   b) Plasmid
   c) Structural gene
   d) Vector

6. Identify A, B, C, D, E in the given diagram of E. coli cloning vector pBR 322 and select the correct option. **[1]**



A	B	C	D	E
(a) Bam HI	tet^R	amp^R	EcoRI	Hind I
(b) EcoRI	tet^R	amp^R	BamHI	Ori
(c) Ori	EcoRI	amp^R	BamHI	tet^R
(d) EcoRI	amp^R	tet^R	BamHI	Ori

a) Only b
b) Only a
c) Only c
d) Only d

7. DNA is extracted by: **[1]**

a) Chilling treatment
b) Ethanol Precipitation
c) Heat shock
d) Denaturation

8. Stirred-tank bioreactors have been designed for: **[1]**

a) ensuring anaerobic conditions in the culture vessel
b) availability of oxygen throughout the process
c) addition of preservatives to the product
d) purification of product

9. Crystals of Bt toxin produced by some bacteria do not kill the bacteria themselves because: **[1]**

a) Toxin is immature
b) Bacteria encloses toxin in a special sac
c) Bacteria are resistant to the toxin
d) Toxin is inactive

10. Some ethical standards are required to: **[1]**

a) Managing natural resources
b) Evaluate the morality
c) Get proper compensation
d) Manage new GMOs

11. Match the following columns and select the correct option. **[1]**

Column-I	**Column-II**
(a) Bt cotton	(i) Gene therapy
(b) Adenosine deaminase deficiency	(ii) Cellular defence
(c) RNAi	(iii) Detection of HIV infection

(d) PCR	(iv) Bacillus thuringiensis

a) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
b) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
c) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
d) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

12. An MNC exploiting biological resources (turmeric) of other nation without proper authorization will be called as: **[1]**

a) Eugenics
b) Bioethics
c) Biopiracy
d) Biopatent

13. In history of biology, human genome project led to the development of: **[1]**

a) Biotechnology
b) Biomonitoring
c) Biosystematics
d) Insects

14. How many statements are correct? **[1]**

i. When resources in the habitat are limited then the population grows in an exponential or geometric fashion.
ii. Intrinsic rate of natural increase and is a very important parameter chosen for assessing impacts of any biotic or abiotic factor on population growth.
iii. Intrinsic rate of natural increase in 1981 for the human population in India was 0.0205.
iv. A population growing in a habitat with unlimited resources shows a sigmoid curve and this type of population growth is called Verhulst-Pearl Logistic Growth.
v. Since resources for growth for most animal populations are finite and become limiting sooner or later, the exponential growth model is considered a more realistic one.
vi. Populations evolve to maximize their reproductive fitness, also called Darwinian fitness (high r-value), in the habitat in which they live.
vii. Some organisms like pacific salmon fish, bamboo breed only once in their lifetime.

a) 6
b) 4
c) 5
d) 3

15. Which of the following would necessarily decrease the density of a population in a given habitat? **[1]**

a) Natality > mortality
b) Immigration > emigration
c) Natality and immigration
d) Mortality and emigration

16. J-shaped growth curve is characteristic of **[1]**

a) yeast cells grown under lab conditions.
b) small population of reindeer experimentally reared in natural environment.
c) human beings.
d) primates.

17. Select correct option from given table: **[1]**

Column I	Column II
(A) Competition exclusion	(i) Pisaster
(B) Resource partition	(ii) Cattle egret
(C) Predation	(iii) Barnacle

(D) Commensalism	(iv) Warblers

a) (A)-(ii); (B)-(i); (C)-(iii); (D)-(iv)

b) (A)-(iii); (B)-(iv); (C)-(i); (D)-(ii)

c) (A)-(iv); (B)-(iii); (C)-(ii); (D)-(i)

d) (A)-(i); (B)-(ii); (C)-(iv); (D)-(iii)

18. In a pond ecosystem, the food chain starts with: **[1]**

a) Phytoplanktons

b) Small insects

c) Small fishes

d) Zooplanktons

19. Net primary productivity (NPP) is: **[1]**

a) Rate of formation of new organic matter by consumers

b) All of these

c) Rate of production of organic matter during photosynthesis

d) Gross primary productivity minus respiratory losses

20. **Assertion (A):** Cellular defence mechanism in eukaryotes is RNAi. **[1]**

Reason (R): RNAi is silencing of a specific tRNA.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

21. How is Agrobacterium tumifaciens able to transform a normal plant cell into a tumour? **[1]**

22. What kind of changes has been observed in day and night length when one moves from the equator to the polar regions? **[1]**

23. Why Western Ghats in India have been declared as biological hotspot? **[1]**

24. What does Red indicate in the IUCN Red list (2004)? **[1]**

Section B

25. Arrange the following steps that are shown in the figure: **[2]**

1. The plasmid is taken up into a bacterial cell which makes protein directed by human DNA
2. DNA segment incorporated into the bacterial plasmid
3. The segment of DNA removed from human cell
4. In Genetic engineering (Recombinant DNA technology)

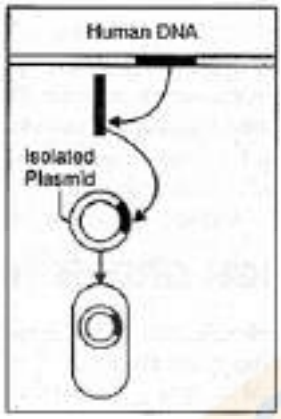
a) $1 \rightarrow 4 \rightarrow 3 \rightarrow 2$

b) $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$

c) $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$ d) $2 \rightarrow 3 \rightarrow 4 \rightarrow 1$

26. What is the use of aeration tank in the treatment of sewage? **[2]**

27. Name the particular technique whose steps are shown in the following figure. Use the figure to summarise the technique in three steps. **[2]**



28. what is golden rice? **[2]**

29. Draw a graph for a population whose population density has reached the carrying capacity. **[2]**

Section C

30. i. Why do farmers prefer bio fertilisers over chemical fertilisers these days? Explain. **[3]**
ii. How do Anabaena and mycorrhiza act as bio fertilisers?

31. Name and explain the technique used for separating DNA fragments and making them available for biotechnology experiments. **[3]**

32. Give the few important characteristics of Genetically modified organisms (GMOs). **[3]**

33. Differentiate between Ectoparasite and Endoparasite. **[3]**

34. Describe the advantages for keeping the ecosystem healthy. **[3]**

35. Can you think of a situation where we deliberately want to make a species extinct? How would you justify it? **[3]**

Section D

36. **Read the following and answer any four questions:** **[4]**

Green manuring is the farming practice where a leguminous plant which has derived enough benefits from its association with appropriate species of Rhizobium, is ploughed into the field soil and then a non-legume is sown and allowed to get benefitted from the already present nitrogen fixer. Some legumes, such as, Crotolaria juncea, Sesbania rostrata, Lencaena leucocephala, etc. are used as green manure. Rhizobia, which fix atmospheric nitrogen in the form of nitrate, live in the roots of leguminous plants. These nutrients are used by non-leguminous plants through the practice of green manuring.

i. Green manures mainly provide nutrient enriched in
   a. magnesium
   b. sulphur
   c. nitrogen
   d. both (a) and (b).

ii. Which of the following plants is used as green manure in crop fields?
   a. Saccharum
   b. Dichanthium
   c. Phyllanthus
   d. Crotolaria

iii. Green manure plants belong to the Family

a. Lamiaceae

b. Papilionaceae

c. Liliaceae

d. Poaceae.

iv. Due to excess use of chemical fertilisers rich in nitrate,_____disease occurred in children.

a. jaundice

b. septicemia

c. methemoglobinemia

d. botulism

v. Green manure is

a. rice

b. maize

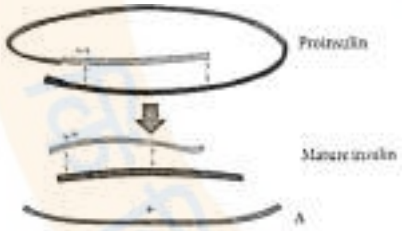
c. sorghum

d. Sesbania.

37. **Read the following and answer any four questions:** **[4]**

Insulin used to cure diabetes was earlier extracted from pancreas of slaughtered cattle and pigs. Insulin extracted from an animal source, though caused some patients to develop allergy or other types of reactions to the foreign protein. Human insulin consists of two short polypeptide chains : chain A and chain B, that are linked together by disulphide bridges. In mammals including humans, insulin is synthesised as a pro-hormone which contains an extra stretch called the C-peptide. This C peptide is not present in mature insulin and is removed during maturation into insulin.

i. Identify A in the given figure.



a. Polypeptide chain A

b. Polypeptide chain B

c. Polypeptide chain C

d. None of these

ii. The following is a list of some stages involved in producing human insulin from genetically engineered bacteria.

1. The bacteria are cultured in a fermenter for large scale production.

2. Recombinant insulin is extracted from the bacterial cells that expresses insulin gene.

3. The same restriction enzyme is used again to cut the bacterial plasmid for insertion of the human insulin gene.

4. Bacteria take up the plasmid carrying the insulin gene.

5. A restriction enzyme is used to cut human DNA to extract the insulin gene. Select the correct order of these stages.

a. 1, 5, 3, 4, 2

b. 4, 5, 3, 2,1

c. 2, 4, 3, 5, 1

d. 5, 3, 4, 1, 2

iii. To insert the insulin gene into bacterial DNA, both the bacterial plasmid and the human chromosome containing the insulin gene are treated with the same restriction enzyme. Using the same restriction enzyme ensures that

a. DNA ligase is able to join the segments of human and bacterial DNA

b. the exact length of nucleotides matching the insulin gene is removed from the plasmid

c. both the bacterial and human DNA will contain sticky ends

d. Sticky ends in the cut plasmid and insulin gene are complementary.

iv. Why is the fermentor important for the production of human insulin by transgenic bacteria?

a. It provides optimal conditions for the transgenic to multiply rapidly.

b. It facilitates the extraction and purification of insulin from transgenic bacteria.

c. It maximise the rate of fermentation of transgenic bacteria.

d. It provides the low-oxygen conditions that are important for insulin production.

v. A bacteriologist carries out his first attempt at engineering E.coli with the gene for human insulin. During the process, he realises that his stock of DNA ligase has depleted but decides to continue anyway. What is a likely consequence of his decision?

a. Bacteria with the rDNA will not be able to form colonies in a fermenter.

b. The resulting plasmids are not able to enter the E.coli bacteria even after applying heat shock.

c. The resulting E.coli bacteria do not contain the human insulin gene.

d. The bacterial plasmids do not have sticky ends and are unable to accommodate the human gene.

Section E

Question No. 38 to 42 are based on the given text. Read the text carefully and answer the questions: **5.0**

European patent office, Munich granted patent for fungicidal use of neem oil, to firm of W.R. Grace & Co. It was challenged by Vandana Shiva and Ajay Phadke who had researched neem in India and it was shown that Grace & Co. had not unveiled any novelty factor in neem's properties. Ethics include rules of conduct by which a community regulates the behaviour and decides as to which activity is lawful and which is not.

38. _____ allow private, monopoly right over animals and plants.

a) Bioethics b) Bioweapons

c) Either Bioethics or Biopatents d) Biopatents

39. Which of the following is not a criteria of granting patent?

a) Novelty b) Prior art

c) Non-obviousness d) Utility

40. On which plants patents have been granted?

a) Brassica campestris b) All of these

c) Piper nigrum d) Punica granataum

41. Rules of conduct that may be used to regulate our activities in relation to biological world are included in _____.

a) bioethics

b) biowar

c) biopatents

d) biopiracy

42. **Assertion (A):** Genes and cells should not be patented.

Reason (R): Genes and cells are not inventions.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

43. How is primary effluent treated in a sewage treatment plant before it can safely be released into rivers or streams? **[5]**